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REQUEST NO.: NIH-10096747
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NIH Fiche to Paper Journal

TITLE:	ACTA RADIOLOGICA (STOCKHOLM, SWEDEN : 1987)
PUBLISHER/PLACE:	Munksgaard International Publishers Copenhagen
VOLUME/ISSUE/PAGES:	1993 Sep;34(5):527-8 527-8
DATE:	1993
AUTHOR OF ARTICLE:	Maeda M; Kimura H; Tsuchida C; Ishii Y; Kubota T
TITLE OF ARTICLE:	MR imaging of monostotic fibrous dysplasia of the
ISSN:	0284-1851
OTHER NOS/LETTERS:	Library reports holding volume or year 8706123 8369194
SOURCE:	PubMed
CALL NUMBER:	W1 AC9411G
REQUESTER INFO:	AB424
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Acta Radiologica 34 (1993) Fasc. 5
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ACTA RADIOLOGICA
ISSN 0248-1851

FROM THE DEPARTMENTS OF RADIOLOGY AND NEUROSURGERY, FUKUI MEDICAL SCHOOL, FUKUI, JAPAN.

MR IMAGING OF MONOSTOTIC FIBROUS DYSPLASIA OF THE CLIVUS

A case report

M. MAEDA, H. KIMURA, C. TSUCHIDA, Y. ISHII and T. KUBOTA

Abstract

We describe the MR appearance of a case of monostotic fibrous dysplasia confined to the clivus. The lesion showed intermediate signal intensity on T2-weighted images which is uncommon among clival diseases.

Key words: Bones, diseases; —, abnormalities; MR imaging, bones.

Fibrous dysplasia is a benign disease most often seen in late childhood or adolescence. The lesion may affect a single bone (monostotic) or many bones (polyostotic). MR findings of monostotic fibrous dysplasia of the clivus have been reported in only one previous case (8), in which only the T1-weighted image was described. We report on a case of monostotic fibrous dysplasia of the clivus and T1- and T2-weighted as well as contrast-enhanced MR images.

Case report

The patient was a 36-year-old male who had suffered from headache for 5 years. The physical and neurologic findings in our patient were within normal limits, and there was no facial deformity. MR imaging was performed, and an abnormal lesion was detected in the clivus. T1-weighted image (Fig. a) showed a homogeneous low signal lesion of the clivus, replacing the normal fatty marrow and extending dorsally and rostrally. On T2-weighted image (Fig. b), the lesion appeared slightly inhomogeneous, and showed intermediate signal intensity. After i.v. infusion of 0.1 mM/kg b.w. Gd-DTPA, the mass was markedly enhanced (Fig. c). CT with bone windowing revealed clival thickening with almost homogeneous bone density (Fig. d), and normal appearance of the facial bone.

The patient underwent biopsy via sublabial transnasal approach. Histologic examination revealed fibrous connective tissue and coarse woven bone without internal lamellar structure (Fig. e), confirming the diagnosis of fibrous dysplasia.

Discussion

Fibrous dysplasia is a developmental disturbance caused by a genetic defect involving proliferation and maturation of fibroblasts (3). Approximately 70% of patients with fibrous dysplasia have the monostotic form, and 30% the polyostotic form. The monostotic form chiefly involves the long bones, with most lesions located in the femur and tibia. The skull is also frequently involved. A marked sclerotic reaction is seen on plain radiography or CT when the skull base or the facial bones are involved (7). To the best of our knowledge, only one case of fibrous dysplasia confined to the clivus has been reported previously (8).

Although the characteristic findings of fibrous dysplasia on radiography (3), scintigraphy (9), and CT (2) have been well described, the literature regarding MR findings in fibrous dysplasia is scant. According to UTZ et al. (12), fibrous dysplasia showed low signal intensity on T1-weighted images, while the signal intensity on T2-weighted images varied from high to intermediate or low. These findings on T2-weighted images may reflect the varying collagen content, extent of bone trabeculae, and cyst formation. Our case showed intermediate signal intensity on T2-weighted images. Because fibrous dysplasia of the skull base is usually sclerotic (3, 7), T2-weighted images of the lesions can be expected to show intermediate or low signal intensity such as we observed.

Most abnormalities affecting the clivus exhibit low signal on T1-weighted images and high signal on T2-weighted images (1). Chordomas (10) or chondrosarcomas (10) are well known to show marked hyperintensity on T2-weighted

Accepted for publication 20 January 1993.

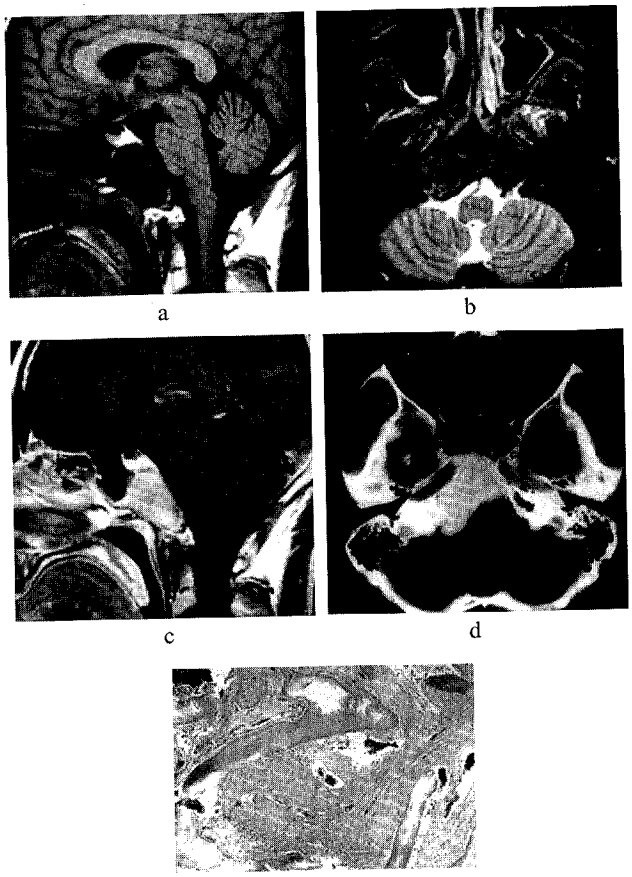

Figure. Fibrous dysplasia of the clivus. a) Sagittal T1-weighted image (TR/TE 350/20) shows a homogeneous low signal intensity mass in the clivus. b) Axial T2-weighted image (TR/TE 2000/80) demonstrates slightly inhomogeneous intermediate signal intensity of the lesion. c) Post-contrast sagittal image demonstrates the well enhancing lesion. d) Axial CT with bone windowing reveals the expansive and homogeneously sclerotic clivus. e) Photomicrograph of the histologic specimen shows fibrous connective tissue and coarse woven bone without internal lamellar structure.

images as are other abnormalities involving the clivus, including lymphoma (5), giant cell tumor (4), and cavernous hemangioma (11). Lesions of the clivus with low or intermediate signal intensity on T2-weighted images are rare. Apart from fibrous dysplasia, osteoblastic metastasis to the clivus, most often from prostatic cancer (6), may show low or intermediate signal intensity. Thus, although CT may show the characteristic features of fibrous dysplasia, the unusual MR findings may contribute extensively to the diagnosis.

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Acta Radiologica 34 (1993) Fasc. 5
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ACTA RADIOLOGICA
ISSN 0248-1851

Technical Note

COMPUTED TOMOGRAPHIC PERCUTANEOUS TRANSSPLENIC PORTOGRAPHY

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Abstract

The diagnosis of liver tumors should be utilized for determination of not only the number of lesions, but also their size, segmental location and extent, and the relationship of the mass or masses to the hepatic vasculature. CT during arterial portography (CTAP) is the most sensitive imaging modality for precise diagnosis of hepatocellular carcinoma (1–3, 5). CTAP is thus widely used as a diagnostic imaging technique, particularly for the detection of small hepatocellular carcinomas (4, 6, 8).

Conventional splenic portography has been carried out for many years using a wide diameter needle, a large amount of contrast medium and a film-screen system (7). Since the development of arterial portography, fewer splenoportograms have been performed due to the high incidence of bleeding and other complications (7). In this study a 0.6-mm (23 gauge) thin needle was used for splenic puncture and CT was used as a detector instead of a film-screen system. With this technique CT during percutaneous transsplenic portography may be performed on an outpatient basis.

Key words: Liver, CT; —, arterial portography; —, splenic portography; —, carcinoma.

Material and Methods

Experimental study. A newly devised 0.6-mm (23 gauge) needle (Hakko, Tokyo) having 2 side holes situated several mm from its tip and a stopper for changing the length of insertion, was used for percutaneous transsplenic puncture (Fig. 1). The safety of contrast injection under various conditions, permitting 20 ml of nonionic iodinated contrast material (140–150 mg I/ml) at injection rates of 0.5 ml, 1.0 ml, and 1.5 ml/s via a power injector (Medrad, Pittsburgh) was evaluated. Incremental dynamic CT examination of the liver using 5-mm contiguous sections with Vertex 3000 Formula scanner (Yokogawa Medical, Tokyo) was performed 8 to 10 s after initiating the injection of contrast medium. The relationship between image quality and injection rate was examined (Table 1). Nine mongrel dogs weighing 12 to 18 kg were examined under i.v. anesthesia (25 mg/kg b.w. of sodium pentobarbital, Dainabott, Osaka). After the examination, the dogs were sacrificed by injection of a large amount of Nembutal. The spleens were subsequently examined.

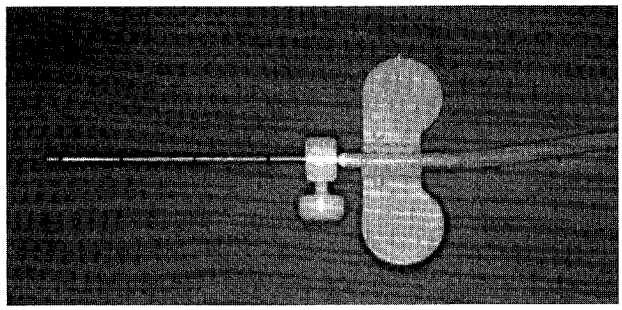

Fig. 1. Newly devised 0.6-mm (23 gauge) thin needle with 2 side holes and a stopper.

Table 1

Experimental study for CT-PTSP

Injection rate	Quality of liver images (number of dogs)			Hemorrhage/ extravasation
	Fair	Good	Excellent	
0.5 ml/s	2	1		none
1.0 ml/s		2	1	none
1.5 ml/s			3	none

Clinical study. Nine patients with hepatocellular carcinoma were examined with 60 ml of nonionic iodinated contrast medium (140–150 mg I/ml) at injection rates of 1.0 to 1.5 ml/s via a power injector (Medrad). Incremental dynamic CT examination of the liver was made 10 s following initiation of the contrast injection. CT was performed with the Vertex 3000 Formula scanner, using 10-mm contiguous sections obtained with a scan time of 1.8 s. All patients were examined with arterial portography (CTAP) between 5 and 10 days before CT during percutaneous transsplenic portography (CT-PTSP). At CTAP 100 to 150 ml of nonionic contrast medium (140–150 mg I/ml) was infused at a rate of 2 to 3 ml/s via the power injector. The 2 techniques for portography were compared based on the criteria in Table 2.

Results

Experimental study. Following the injection of contrast medium into the spleen, neither bleeding around the spleen nor extravasation of contrast medium was observed in any dog at CT or at autopsy regardless of the injection rate

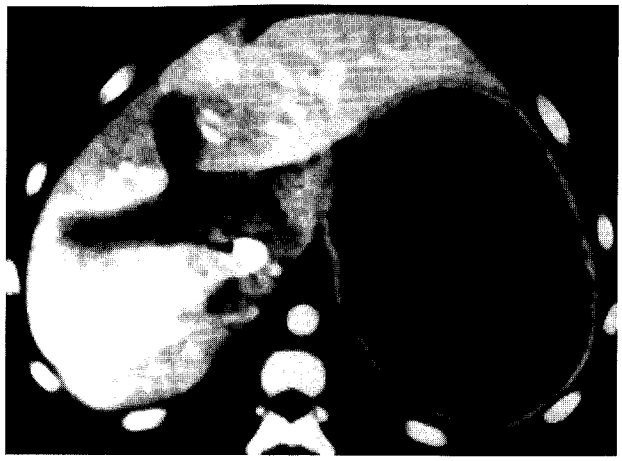

Fig. 2. Experimental portogram of the liver by CT-PTSP in a dog. Uniformly increased density of the liver.

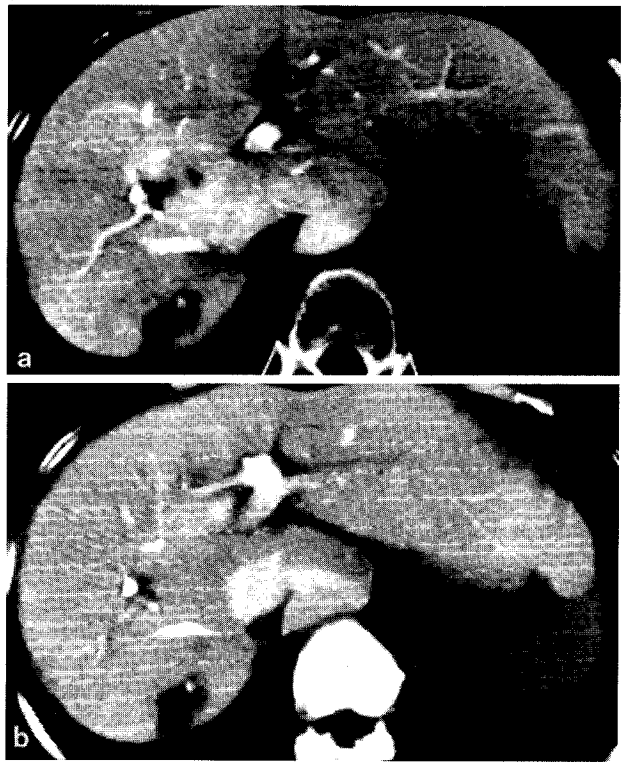

Fig. 3. a) CTAP and b) CT-PTSP in a patient with hepatocellular carcinoma.

(Table 1). The optimum rate of contrast injection was 1.0 to 1.5 ml/s. Excellent or good uniform opacification of the liver was noted in 7 out of 9 dogs (Fig. 2).

Clinical results. Images at CT-PTSP were superior to or equivalent to CTAP in 7 of 9 cases following injection of 1.0 ml contrast/s (Table 2, Fig. 3). Subcapsular contrast accumulation of the spleen following the injection of 1.5 ml/s of contrast was noted in one case. This was the only patient who experienced discomfort during or after the examination but any medication was not needed. The patients were allowed to walk freely after 30 to 60 min of rest.

Table 2

Clinical results of CT-PTSP

Pat/Age/Sex	Contrast injection rate, ml/s	Evaluation	Complication
1/73/M	1.5	fair	(+)*
2/68/M	1.0	good	(-)
3/65/F	1.0	excellent	(-)
4/62/F	1.0	excellent	(-)
5/67/M	1.0	good	(-)
6/64/M	1.0	fair	(-)
7/59/F	1.0	excellent	(-)
8/55/M	1.0	good	(-)
9/71/M	1.0	good	(-)

* subcapsular appearance of contrast material.
Evaluation criteria: inferior to CTAP; equivalent to CTAP; superior to CTAP.

Discussion

To localize focal liver lesions, angiography, CT, or ultrasonography have been utilized. Recently, for more precise diagnosis of hepatocellular carcinoma, CTAP has been developed (1–3, 5). However, this diagnostic modality cannot be performed routinely or on an outpatient basis.

CT-PTSP is an alternative method to visualize the portal system. CT has much higher contrast resolution than conventional radiography with a film-screen system and can thus detect a lower dose of contrast medium in the portal system and the liver after injection in the spleen by a thin needle. Our experimental and clinical examinations showed that this new approach was safe.

In clinical use, 78% of the CT-PTSP examinations were equivalent or superior to conventional CTAP. A total dosage of 60 ml of contrast medium at an injection rate of 1.0 ml/s provided the best results. With this method, it is possible to perform diagnosis and follow-up examinations on an outpatient basis. The method can also be used for evaluating collateral channels of the portal system as well as hepatocellular carcinoma.

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Accepted for publication 17 February 1993.